

**Department of Veterans Affairs  
Quality Enhancement Research Initiative (QUERI)**

**Polytrauma/Blast-Related Injuries QUERI Center  
2008 Strategic Plan**



*Polytrauma/Blast-Related Injuries*

*Improving Care for Veterans with  
Polytrauma and Blast-Related Injuries*

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## Strategic Plan Executive Summary

### I. Center Mission, Scope and Goals

**The mission** of the Polytrauma and Blast-Related Injuries (PT/BRI) QUERI is to promote the successful rehabilitation, psychological adjustment and community re-integration of individuals who have polytrauma and blast-related injuries. Consistent with the VHA definition of polytrauma,<sup>1</sup> PT/BRI QUERI defines polytrauma as two or more injuries to physical regions or organ systems, one of which may be life threatening, resulting in physical, cognitive, psychological, or psychosocial impairments and functional disability.

**The scope** of the PT/BRI QUERI includes the full range of health problems, health care system and psychosocial factors represented in this mission. However, PT/BRI QUERI focuses on filling gaps and implementing research to improve health outcomes for two high priority and prevalent blast-related injuries that occur in the context of other combat injuries: Traumatic Brain Injury (TBI) and traumatic amputation.

Our efforts are focused primarily on enhancing the new and rapidly evolving Polytrauma System of Care which has targeted individuals whose combat injuries frequently include TBI. As amputation care becomes more integrated into the Polytrauma System of Care, PT/BRI will sharpen its focus on traumatic amputations.

**PT/BRI QUERI's Clinical and Implementation Science (IS) goals** are listed below. Clinical goals 1- 4 below are our highest priority for this next Fiscal Year.

#### Goals to Improve Practice

1. Optimize care coordination and transitions across care systems and settings for patients with polytrauma and blast-related injuries.
2. Ensure that blast-exposed veterans receive screenings for high frequency "invisible" problems, including TBI, hearing loss, vision loss, pain, and mental health problems.
3. Optimize caregivers'/family members' ability to provide supportive assistance to veterans with impairments resultant from polytrauma and blast-related injuries.
4. Promote identification and evaluation of potentially best practices for polytrauma rehabilitation.
5. Improve treatment and outcomes for traumatic amputation within the polytrauma system of care.
6. Identify and test potentially fruitful strategies to improve self-management, including tele-rehabilitation, cognitive aids, augmentative communication and environmental controls.
7. Promote the development of efficient, sustainable and valid data systems for identifying patients, their medical problems, service needs and outcomes.

#### Implementation Science (IS) Goals

- ISa. Identify and test methods for improving practice when the scientific evidence is not well developed.
- ISb. Identify and test methods for measuring readiness for, adoption of and sustainability of practice improvements.

**To fulfill its mission and achieve its goals**, PT/BRI QUERI is developing and coordinating a broad network of: (a) investigators from the VA (including HSR&D and RR&D Centers of Excellence (COEs) and Research Enhancement Award Program (REAP) Centers, and the National Center for PTSD), DoD and academic institutions, (b) consumers (patients and their

caregivers), (c) clinician experts, and (d) VHA managers and operations leaders who share our mission. In addition, PT/BRI QUERI is adapting the QUERI 6-step process to reflect: the system of care is not static; standard literature reviews will need to be supplemented with expert opinion and consensus processes to identify potentially best or better practices; and, interventions may need to be adapted and tested in local contexts using methods other than RCTs. That is, PT/BRI QUERI is modifying the QUERI process to include a focus on the contextual and evolving nature of evidence for polytrauma rehabilitation.

## **I.1 Scope and Clinical Focus**

**The scope** of the PT/BRI QUERI includes the full range of health problems, health care system and psychosocial factors represented in this mission. The PT/BRI QUERI, therefore, is not limited to one medical problem. Instead, this QUERI focuses on the complex pattern of co-morbidities and related functional problems and health care needs among the combat-injured.

Despite the breadth of this scope, we have identified two **priority clinical foci**: traumatic brain injury (TBI) with polytrauma and traumatic amputation with polytrauma. That is, our clinical priorities are TBI and traumatic amputation in the context of injuries to other body structures and systems (including mental health). Both TBI and traumatic amputation are priority areas for VHA and of increased prevalence due to the Global War on Terror (GWOt).<sup>2-4</sup> The cohort that is the primary target of our activities is Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) VA patients, many of whom remain on active duty during their initial course of treatment in the VA. However, QUERI activities will benefit all patients with polytraumatic injuries, regardless of service era and context of injury (e.g., training, war zone, or post-deployment), particularly those who have injuries caused by explosions.

Because our activities are focused on the VHA Polytrauma System of Care, PT/BRI QUERI initially partnered closely with the Polytrauma Rehabilitation Centers (PRCs). These centers were the first level of care to be mobilized in the Polytrauma System of Care and were charged with setting the standards for polytrauma care throughout the VA. Although we maintain that partnership, since the mobilization of the second and third levels of Polytrauma care, our primary focus has shifted to the less severely injured or those discharged from the PRCs. This expansion of our focus from PRC inpatient rehabilitation for the severely injured to outpatient and home based facilities for those with milder or more stable injuries parallels the roll out of the Polytrauma System of Care.

**Other QUERI Overlap.** Other QUERIs also focus on improving health outcomes for OEF/OIF veterans with post-deployment health problems. In addition, QUERIs share implementation science goals. PT/BRI QUERI collaborates with other QUERIs to advance both our clinical and implementation science goals. For example, PT/BRI QUERI has been collaborating with the SCI QUERI around topics of relevance to both polytrauma and SCI patients (e.g., wound care) and with the IHI QUERI around examination of methods for measuring organizational readiness to change. The PT/BRI QUERI Implementation Research Coordinator is responsible for initiating communication with other QUERI Centers to ensure adequate coordination of research that traverses QUERI conditions and that involves new veterans.

## **I.2 Significance and Consequence: Epidemiology, Morbidity/Mortality, Quality of Life and Costs**

During the GWOt, America's Armed forces are sustaining new and complex patterns of blast-related injuries.<sup>3-5</sup> As of November 24, 2008, 33,424 service members have sustained non

mortal injuries during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF, in and around Afghanistan) that were severe enough to require immediate medical attention.<sup>6</sup> In this era of modern warfare, the majority of combat injuries are blast-related.<sup>7-9</sup> In combat, sources of blast injury include artillery, rocket and mortar shells, mines, booby traps, aerial bombs, improvised explosive devices and rocket propelled grenades. The severity and pattern of blast injuries depends on the explosive composition and amount of material involved, surrounding environment, delivery method, distance between the victim and the blast, and presence of intervening protective barriers or environmental hazards.<sup>10</sup> Due to improvements in body armor, as well as in battle site and acute trauma care, more individuals are surviving beyond the acute phase of blast injuries.<sup>4,11</sup> Consequently, the military and VA are providing medical care to individuals with blast injuries who may have died in previous wars.

The four basic mechanisms of blast injury are termed as primary, secondary, tertiary, and quaternary.<sup>5</sup> Primary injuries are due to high-order explosive over-pressurization shock waves moving through the body from solid and liquid sections to gas-filled organs, such as the lungs, gastro-intestinal tract and middle ear. These injuries are not necessarily obvious. Secondary injuries are due to bomb fragments and other objects propelled by the explosion. Tertiary injuries result from the blast wind (not the over-pressurization shock wave) throwing the victim and can include bone fractures and traumatic amputation. Quaternary injuries are those not included in the first three classes, such as burns, crushing injuries and respiratory injuries.

Given the possible effects of explosions on the human body, it is not surprising that blast injuries are often “polytraumatic”. Injured body systems and structures include, (1) auditory/vestibular; (2) eye, orbit, face, (3) respiratory, (4) digestive, (5) circulatory, (6) central nervous system, (7) renal/urinary tract, (8) extremity, (9) soft tissue, (10) mental health, and (11) pain.<sup>12</sup> Particularly common is traumatic brain injury (TBI). It has been estimated that over 60% of blast-injuries result in Traumatic Brain Injury<sup>3,13</sup> and TBI has been labeled the “signature injury” in the GWoT.<sup>14</sup> Consequently, best practice for blast-related polytrauma requires a focus on TBI in the context of other injuries.

PT/BRI QUERI conducted a study to identify high priority problems among VA polytrauma inpatients. During the first four years of the GWoT, the PRCs treated 566 active duty service members, 188 of whom were injured in OEF/OIF.<sup>15</sup> Most war-injured patients had traumatic brain injury, injuries to several other body systems and organs and associated pain. Blasts impacted more body systems and/or organs than other mechanisms of injury, with the median and modal number of injuries associated with blasts being five (range 1 to 9). Soft tissue, eye, oral and maxillofacial, otologic, penetrating brain injuries, post-traumatic stress syndrome symptoms, and auditory impairments were more common in blast-injured patients than in those with war injuries of other etiologies.<sup>15</sup>

Most PRC patients have penetrating or moderate to severe TBI. However, the majority of TBI cases among OEF/OIF returnees are mild in severity.<sup>16,17</sup> The military has defined mild TBI (mTBI) as an injury to the brain resulting from an external force and/or acceleration/deceleration mechanism from an event, such as a blast, fall, direct impact or motor vehicle crash, which causes an alteration in mental status typically resulting in the temporally-related onset of symptoms.<sup>18</sup> The number of OEF/OIF who have mTBI is difficult to estimate because many individuals with mTBI do not seek medical attention. However, recent research suggests that it may approach 20%.<sup>16,17</sup> Significant challenges in identifying and treating OEF/OIF veterans with mTBI include: (a) lack of objective diagnostic tests; (b) symptom overlap with other conditions, including PTSD and depression, and (3) lack of problem recognition or reluctance to admit stigmatizing or career-limiting problems among individuals who served in OEF/OIF.<sup>19</sup>

Most mTBI cases resolve within weeks or months.<sup>20</sup> However, some develop persistent symptoms often labeled “postconcussive syndrome”.<sup>21</sup> Controversy remains as to whether persistent symptoms in individuals who sustain mTBI are caused primarily by the TBI, psychological factors, or an interaction between the two.<sup>17,22,23</sup> In general, research on the course of recovery from mTBI is based on concussed athletes or survivors of vehicular crashes and falls. Whether these findings generalize to mTBI secondary to blasts is an important topic for future research.

### **1.3 Treatment/Management Evidence Base**

There is not a strong evidence base for best practice for rehabilitation of TBI with polytrauma, particularly blast-related polytrauma. The PT/BRI QUERI priorities, therefore, stem from research on best practices for TBI rehabilitation, chronic disease management, and stakeholder needs. We selected the empirically-supported Chronic Care Model (CCM)<sup>24-26</sup> as a clinical conceptual framework because the effects of blasts and other battlefield injuries are likely to be life-long. Furthermore, given the chronicity of the conditions for which individuals seek rehabilitation care, it is not surprising that there is considerable conceptual overlap between rehabilitation best practice and the CCM. Both, for example, seek to optimize care coordination, treatment planning, environmental support, including support for family members/caregivers, and support for patient self-sufficiency/self-management in order to help patients achieve the highest possible level of functioning and quality of life.<sup>25-29</sup> The relevance of the CCM to individuals with polytraumatic injuries is further demonstrated by the fact that about half of patients with a chronic condition suffer from multiple chronic conditions.<sup>24</sup> That is, the CCM addresses the needs of patients with multiple morbidities.

**Data Systems Development.** There is strong evidence that reliable and valid data systems for tracking and monitoring patients are necessary for effective management of complex and chronic medical conditions. Evidence indicates that effective chronic illness care depends on information systems that assure ready access to data on individual patients as well as populations of patients.<sup>30-31</sup> Data systems are needed to provide timely reminders for providers and patients, identify relevant subpopulations for proactive care, facilitate treatment planning, share information with patients and providers to coordinate care, and monitor performance of teams and care systems. Because of the fundamental role data systems play in disease management, when our QUERI began in 2005, database development had been our highest priority goal. At that time there was almost a complete absence of systems for identifying and monitoring outcomes in polytrauma patients. Over the past three years, however, considerable progress has been made in this goal area, in large part because this QUERI goal was consistent with VHA priorities. Therefore, while our QUERI continues to promote the development and evaluation of databases for patients with polytrauma, there is no longer a need for database development to be our highest priority goal.

**Care Transitions and Coordination.** Patients with complex care needs often require care in multiple settings. They are also particularly vulnerable to care transition failures.<sup>32</sup> Indeed, breakdowns in communication and care coordination as patients transition across care systems, settings and providers interfere with effective, efficient and safe service delivery and result in inadequate patient and caregiver preparation for receiving care at the next setting.<sup>24,32-35</sup> It is, therefore, not surprising that care coordination plays an important role in the CCM model and rehabilitation best practice.<sup>34,36</sup> There is also consensus that care coordination over the life span is essential for management of TBI with polytrauma<sup>37</sup> and VHA has established specific care structures to facilitate care coordination to injured veterans, regardless of where they live,

including a polytrauma case management system and a telehealth network.<sup>38</sup> Identification of optimal approaches to care coordination is limited by the fact that there is no consensus as to what constitutes coordinated care and what outcomes should be measured.<sup>39</sup> There is also a lack of measures to assess the quality of care transitions. However, there is a growing understanding of what effective care transitions involve. At the general level, effective care transitions involve: (a) communications between the sending and receiving care teams, (b) preparation of the patient and the caregiver for what to expect at the next level of care, (c) medication reconciliation, (d) a follow-up plan, and (e) education about warning symptoms to monitor.<sup>32</sup> Data systems and information support technologies can serve an important role in facilitating the timely transfer of essential information as patients traverse care systems and settings.<sup>24,32</sup>

**Screening.** Failure to identify and treat TBI exacerbates the disability and burden on society associated with TBI related symptoms.<sup>27</sup> Furthermore, the social, emotional, and behavioral problems that frequently result from TBI are often misdiagnosed and untreated. Thus, proper identification of TBI is a critical step in determining and providing appropriate treatment for those in need. Furthermore class II evidence suggests that earlier treatment may be associated with better outcomes.<sup>40</sup> To ensure that veterans returning from Iraq and Afghanistan with combat-related TBI receive appropriate healthcare, the VA instituted nationwide screening for all OEF/OIF VA users in April, 2007.<sup>41</sup> The VA screening tool is based on the brief screening tool developed by the Defense and Veterans Brain Injury Center (DVBIC) and tested in active duty.<sup>42</sup> A priority for the PT/BRI QUERI is to promote research supporting the implementation of this screening tool. Furthermore, as discussed above, individuals with blast-related TBI often have impairments in other areas. The work of QUERI investigators indicates that pain and visual dysfunction is particularly common among polytrauma patients with TBI.<sup>15, 43</sup>

**Caregiver Burden.** A significant number of caregivers, spouses and family members of persons with TBI report stress, depression, anxiety and decreased time and energy for recreational activities.<sup>40</sup> The depression is often enduring.<sup>44</sup> Emotional and behavioral changes in the individuals with TBI are associated with caregiver distress and poor family functioning.<sup>40</sup> In one relatively large study, injury severity was also associated with caregiver burden.<sup>45</sup> Inferring from available data, one would expect for caregivers of patients with polytraumatic combat injuries to be at risk for adverse effects. There is some data to suggest that caregiver distress has a negative impact on the caregiving.<sup>46-48</sup> In a recent report, the Office of the Inspector General emphasized the need for VA to address the needs of the family members of patients who have TBI with polytrauma: "To adequately meet the needs of its TBI patients, VHA needs to provide additional help for the family members and other caregivers so vital to the well-being of these patients in the long-term."<sup>37(p.i)</sup> While the need is great, research on interventions to meet the support and information needs of family members of TBI patients is limited.<sup>40</sup>

## **I.4 Current Practices and Quality/Outcome Gaps**

### **Current Practice**

The severity of polytraumatic combat injuries and the circumstances in which they occur cause not only significant impairments, but also psychological stress to injured soldiers and their families. New systems of care are needed to meet the rehabilitation needs and optimize functional outcomes in this new patient group. Recognizing this, Congress passed Public Laws 108-422 (section 302) and 108-447 and the Secretary of Veterans Affairs designated four Polytrauma Rehabilitation Centers (PRCs; Minneapolis, MN, Palo Alto, CA, Richmond VA, Tampa, FL) to provide specialized inpatient rehabilitation treatment and expand clinical expertise in polytrauma throughout the VA.<sup>49,50</sup> The VA is in the process of establishing a fifth

PRC in San Antonio, Texas. The PRCs form the central point within the Polytrauma System of Care which also includes 22 specialized outpatient and subacute rehabilitation programs referred to as Polytrauma Network Sites (PNSs) that are geographically distributed within each of the VA's 21 integrated service networks (VISNs), designated polytrauma teams at smaller, more remote VA facilities, and a point of contact at all other VA facilities.<sup>51</sup>

The Polytrauma System of Care continues with its rapid evolution. There are currently official DoD/VA clinical practice guidelines for mTBI and Amputation, as well as best practice models and pathways that are being refined for emerging consciousness, transitional rehabilitation, long term care, and TBI-PTSD co-morbidity. The first performance measure specific to injured OEF/OIF service members and veterans was issued October 19, 2006, to ensure prompt access to VA health services.<sup>52</sup> It requires that 90% of new veterans with combat injuries wait no longer than 30 days for specialty care services and that 95% of severely injured OEF/OIF service members/veterans are contacted by their VA case managers within 7 days of notification of transfer to VA. Three performance measures related to the TBI Clinical Reminder have been developed and are included in the OQP 2009 Technical Manual. The first measure is classified as mission critical, and requires screening for TBI of all OEF/OIF who present for medical care. This measure requires that 90% of new veterans with OEF/OIF service have the TBI screening completed. The second measure is transformational, and requires that the designated service contacts a veteran who has a positive screen within 14 working days to schedule a comprehensive evaluation for TBI. The third measure is also transformational, requiring that comprehensive evaluation for TBI occur within 30-days of screening. Recent data suggests that the timeliness of follow up evaluation is an area where improvements are being made,<sup>19,53</sup> but the data is still being monitored for continued enhancement to the process.

### **Quality and Outcome Gaps**

To identify practices and quality/outcomes gaps for polytrauma inpatients, the PT/BRI QUERI conducted a PRC Needs Assessment in FY 2006 based on 56 semi-structured face to face interviews with PRC providers and consultants from services (pain, PTSD, blind rehabilitation, infectious disease) that work closely with the PRCs.<sup>54</sup> Findings from the PRC Needs Assessment indicate that VA polytrauma inpatients are demographically and clinically distinct from other VA rehabilitation inpatients and that rehabilitation providers and the system of care are adapting to meet the needs of this new group of patients and their families. The needs expressed by PRC providers can be grouped into the following content areas: (1) database development, (2) care coordination, (3) screening promotion, (4) provider education and (5) best or better practices for polytrauma rehabilitation, particularly for rehabilitation for minimally responsive TBI patients and for optimizing caregiver outcomes, and (6) provider stress. Needs 1 and 2 are consistent with those reported by the Office of the Inspector General.<sup>37</sup> Needs 3 and 4 are consistent with a VHA initiative to promote TBI education<sup>55</sup> and an Under Secretary for Health Information Letter to promote TBI screening.<sup>56</sup> Since collection of these data VHA has instituted national screening for TBI.<sup>41</sup>

To identify practices and quality/outcomes gaps for outpatients with comorbid PTSD and mTBI, PT/BRI QUERI conducted a PNS/PTSD Team Needs Assessment in FY 2008 in collaboration with the National Center for PTSD. This study was based on 40 semi-structured telephone interviews with PNS and PTSD representatives from each of the VA's 21 VISNs. Providers identified challenges from the time of post-deployment screening through treatment, gaps within the health care system, and educational needs. Taken together, findings point to the need for more integration of mental health and rehabilitation services, innovated strategies to engage OEF/OIF patients who no show for follow up evaluations and treatment, guidance to clinicians



on best practices for mTBI/PTSD, a systematic approach toward patient and provider education, and research to fill evidence gaps concerning blast-related TBI and associated comorbidities.

### **I.5 Significant Influences on Current Practice**

The following VA and DoD Offices, Programs and Initiatives influence the VA polytrauma care and hence are PT/BRI QUERI partners.

#### **VHA Programs, Offices and Initiatives**

Amputation System of Care: The Amputation System of Care is a separate tiered-system with ties to the Polytrauma System of Care. It will be implemented in FY 2009.

Employee Education System (EES): EES is responsible for designing, developing, and implementing state-of-the-art health care training programs for VHA medical care personnel. EES sponsored the Veteran Health Initiative (VHI) independent study course on TBI, a specialized education program for the PRCs and PNSs, and several satellite broadcasts for polytrauma providers.

Polytrauma System of Care: The polytrauma system of care operates under the leadership of the VACO Rehabilitation Office. It consists of the four Commission on Accreditation of Rehabilitation Facilities (CARF) accredited PRCs which are linked to 22 Polytrauma Network Sites (PNS), one in each VISN. A PRC in San Antonio, TX is under construction. The PNSs became operative in December of 2005 and are charged with providing inpatient rehabilitation and outpatient care to former PRC patients and OIF and OEF veterans who present with milder war-related injuries and rehabilitation needs, as well as for coordinating care with patients' local facilities. This system of care also includes Polytrauma Support Clinic Teams (PSCT) that follow stable sequelae at facilities closer to the veteran's home, and a Polytrauma Point of Contact (PPOC) at every facility. In addition, workgroups from the Physical Medicine and Rehabilitation (PM&R) Program Office and the Prosthetics and Sensory Aids Service are developing strategic plans to more closely link amputation care with the Polytrauma System of Care.

Seamless Transition Office: The Seamless Transition Office (STO) coordinates all VA activities related to the provision of benefits and health care for service members transitioning directly from Military Treatment Facilities (MTFs) to VA facilities. The STO also provides coordination within VA for all other initiatives of the DoD and States to provide outreach services to OIF and OEF veterans. The STO recently rolled out a database of service members transferred from MTFs to VAMCs that may be of use to the PT/BRI QUERI.

Telehealth Initiative: The Care Coordination Office designed and provides technical assistance in the operation of a polytrauma telehealth network to improve patient access to PRC specialists and facilitate the transfer of PRC expertise in TBI and other impairments associated with polytrauma between the PRCs and PNSs. Expansion of this system to the PSCTs and facilities with specialized expertise in amputation care is under consideration.

TBI Model Systems of Care: The 16 National Institute on Disability and Rehabilitation Research (NIDRR) funded Model System Centers collect and analyze data from patients with TBI to contribute to the evidence base for medical rehabilitation. Plans are underway for the VA Polytrauma System of Care to link with the TBI Model System database to create a VA TBI registry and collected long-term follow up data on VA TBI patients.

VHA and DoD Mild TBI Clinical Practice Guidelines: Mild TBI Clinical Practice Guidelines (CPG) will be released in FY 2009. A variety of educational interventions, including non-interactive, web-based education, are planned to support the release and implementation of this CPG.

VHA National Polytrauma Pain Subcommittee: This subgroup of the VHA National Pain Research Working Group focuses on identifying best practices for pain assessment and management in polytrauma and research priorities within this area.

### **DoD Research, Education and Clinical Programs**

Amputation Patient Care Program. The Amputee Patient Care Program, located at Walter Reed Army Medical Center, was developed to meet the comprehensive medical, rehabilitative, and social needs of amputees injured in the current global war on terrorism, with the goal of maximizing subsequent patient outcomes utilizing a sports medicine approach.

Defense and Veterans Brain Injury Center (DVBIC). Coordinated at Walter Reed Army Medical Center, DVBIC is a multi-site medical care, clinical research and education center funded through the DoD. The 8 DVBIC sites include the four VA PRCs, 3 MTFs and a civilian partner. The DVBIC is part of the newly funded DoD Center of Excellence in Psychological Health and TBI.

### **I.6 QUERI Center Goals**

Goal areas and objectives within each goal area were identified through literature reviews, needs assessment studies, the PT/BRI QUERI Executive Committee, which consists of experts and Operations leaders in areas relevant to the QUERI mission, and external stakeholder groups, including the US Congress.

In the tables that follow we list the PT/BRI QUERI clinical and implementation goals. For the Goals to Improve Practice, we also list the time frame for achieving each objective: short-term = 1-2 years; medium-term = 3-5 years; long-term = greater than 5 years. Goals to Improve Practice are listed in order of priority. Improving the Polytrauma System of Care is the overarching goal of these specific QUERI goals and objectives. TBI with polytrauma is the primary clinical problem that this system is designed to address. As amputation care becomes more closely linked to the polytrauma system of care, PT/BRI QUERI will expand its focus to include the promotion of evidence-based practice for traumatic amputation.

The Implementation Science (IS) Goals are time independent, meaning that we work toward accomplishing these goals on an ongoing basis. The Implementation Science Goals are influenced by the fact that the system of care is new and the evidence-base for best practice is not well established. To achieve our mission, PT/BRI QUERI needs to develop and adapt implementation strategies to this more ambiguous context. In this way, PT/BRI QUERI's clinical and implementation science goals are closely linked.

<b>Table 1</b> <b>Goals to Improve Practice, Objectives, Time Frame, and Expected Products</b>	
<b>Goal 1:</b> Optimize care coordination and transitions across care systems and settings for patients with polytrauma and blast-related injuries.	
1a: Collaborate with PM&R and EES to develop fact sheets for providers that includes findings from PT/BRI QUERI research.	Short-Term
1b: Dissemination of product 2a so that providers across VHA can access this information when needed (at time of encounter).	Short-Term
1c: Identify and implement methods of dissemination to providers outside the VA.	Medium-Term
1d: Develop and test tools to facilitate care transitions among PRC patients.	Short-Term
1e. Identify community reintegration problems and treatment preferences among OEF/OIF.	Short-Term
1f. Develop/modify and test interventions to facilitate community reintegration among OEF/OIF with PT/BRI.	Short to Medium-Term
<b>Product 1:</b> Fact sheets to educate providers about impairments in patients with polytrauma. <b>Product 2:</b> Efficient and effective care coordination tools. <b>Product 3:</b> Reliable and valid measure of community reintegration.	
<b>Goal 2:</b> Ensure that blast-exposed veterans receive screenings for high frequency “invisible” problems, including TBI, hearing loss, vision loss, pain, and mental health problems.	
2a. Collaborate with VA HSR&D to promote and conduct research supporting implementation of the VA TBI screening tool.	Short-Term
2b. Identify and implement informatics to promote screening of other high frequency impairments.	Short-Long Term
<b>Goal 3:</b> Optimize caregivers’/family members’ ability to provide supportive assistance to veterans with impairments resultant from polytrauma and blast-related injuries.	
3a: Informal caregiver needs assessment to characterize information needs of caregivers.	Short-Term
3b: Implement a Family Care Advisory Group to characterize usual care and potentially best practices for caregivers of patients with combat related polytrauma.	Short-Term
3c: Develop/modify and test educational materials adapted to findings in 3a.	Short to Medium-Term
3d: Test interventions to reduce caregiver burden and promote shared decision making.	Long-Term
<b>Product 4:</b> Educational materials and resources for caregivers. <b>Product 5:</b> Standardization of family care across the PRCs. <b>Product 6:</b> Interventions to improve family care.	

<b>Table 1 (continued)</b>	
<b>Goal 4:</b> Promote identification and evaluation of potentially best practices for polytrauma rehabilitation.	
<b>4a.</b> Identify best practices for treatment of pain among OEF/OIF with polytrauma and blast-related injuries.	Short to Long-Term
<b>4b.</b> Identify best practices for treatment of OEF/OIF who have TBI and psychiatric disturbance, including PTSD.	Short to Long-Term
<b>4c.</b> Identify best practices for treatment of OEF/OIF who have TBI and sleep disturbance.	Short to Long-Term
<b>4c.</b> Identify best practices for treatment of OEF/OIF who have TBI and hearing and/or vision loss.	Short to Long-Term
<b>Product 7:</b> Empirical articles, evidence syntheses and other reports that disseminate best practices.	
<b>Goal 5:</b> Improve treatment and outcomes for traumatic amputation within the polytrauma system of care.	
<b>5a.</b> Evaluate the new Clinical Practice Guidelines for Amputation Care to determine role of PT/BRI QUERI in promoting guideline adherence.	Short-Term
<b>5b.</b> Obtain leadership input and direction on the QUERI role in the traumatic amputation system of care.	Short-Term
<b>5c.</b> Identify high priority gaps and needs in the VA system of care for patients with traumatic amputations.	Medium to Long-Term
<b>5d.</b> Identify and implement interventions to improve outcomes for OEF/OIF with combat-related amputations.	Long-Term
<b>5e.</b> Identify and test strategies for matching prosthetic devices to the needs and impairments of amputees.	Long-Term
<b>Product 8:</b> Tools for evaluating appropriateness of <u>prosthetic devices for amputees</u> who also have TBI.	
<b>Goal 6:</b> Identify and test potentially fruitful strategies to improve self-management, including telerehabilitation, cognitive aids, augmentative communication and environmental controls.	Medium to Long-Term
<b>Goal 7:</b> Develop efficient, sustainable and valid data systems for identifying patients, their medical problems, service needs and outcomes.	Short to Long-Term
<b>7a:</b> Collaborate with PM&R on enhancement of Functional Status Outcomes Database (FSOD) so that it allows for reporting of injuries and impairments in the war injured and tracking of their outcomes over time.	Short-term
<b>7b:</b> Collaborate with PM&R to develop and evaluate a TBI evaluation template to be used system-wide.	Short-term
<b>Product 1:</b> Enhanced FSOD for tracking injuries and impairments in war-injured rehabilitation patients across the continuum of care.	
<b>Product 2:</b> Template for evaluating patients who screen positive for TBI through Clinical Reminder system.	
<b>Product 3:</b> Database containing results of TBI Screening (positive and negative screens) and TBI specialty evaluation results (positive screens only).	
<b>Product 4:</b> Reports describing subgroups of polytrauma patients and their patterns of service use.	

*Note.* Short-term = 1-2 years; Medium Term = 3-5 years; Long-term = 5+ years.

<b>Table 1 (continued)</b> <b>Implementation Science Goals</b>	
<b>ISa:</b> Identify and test methods for improving practice when the scientific evidence-base is not well developed.	
Use qualitative methods, including Rapid Assessment Process, to identify emerging needs in the field and priorities for research and quality improvement.	Short to Long-Term
<b>ISb:</b> Identify and test methods for measuring readiness for, adoption of and sustainability of practice improvements.	
Evaluate the utility of the Organizational Change Manager (OCM), a tool developed outside of VA, for measuring organizational readiness for change for VA implementation projects.	Short to Long-Term
<b>Product:</b> An instrument that can be used by VA investigators to determine the likelihood of implementation success and identify barriers to success before project start and implementation.	

*Note.* Implementation Science Goals are not time dependent.

### 1.7 Plans for Achieving QUERI Center Goals

Ongoing and planned projects are detailed in our Annual Report. Here we describe the overarching approaches we are using to fulfill our mission and achieve our goals.

**QUERI Implementation Process.** PT/BRI QUERI is using the QUERI six-step process to guide its research activities. However, we have adapted this process to take into account the nature of the evidence-base for polytrauma rehabilitation. That is, we have modified the QUERI process to reflect the fact that: (a) the system of care is new, (b) literature reviews will not be the primary source of information on best practices for polytrauma, (c) potentially better practices may need to be adapted and tested in local contexts rather than through RCTs. Below we list the PT/BRI QUERI version of the QUERI six-step process:

- 1) Identify high priority clinical problems and outcomes for patients with polytrauma and blast injuries.
  - a. Develop data systems to facilitate Step 1.
- 2) Identify or develop potentially best or better practices for polytrauma rehabilitation.
  - a. Develop tools and structures that facilitate best practice.
  - b. Promote and conduct research that builds the evidence base for best practice.
- 3) Promote and conduct research to identify gaps and needs in the polytrauma system of care.
- 4) Implement interventions to promote the adoption, evaluation and modification of potentially best or better practices.
- 5) Demonstrate a link between practice changes and improved patient and caregiver outcomes.
- 6) Demonstrate that these interventions improve quality of life, physical and mental health, and community reintegration for injured service members.

The most obvious change to the QUERI 6-step process is our explicit emphasis on the contextual nature of the evidence needed to improve practice in Steps 2 and 4, our inclusion of foundation building activities as integral to adapted QUERI steps 1 and 2. Another adaptation which is not related to the nature of the evidence but rather to the scope of our QUERI's work is the inclusion of caregivers as an intervention target in step 5. Our plan is to refine these modifications to the QUERI implementation model through evaluation of our practice improvement efforts and ongoing assessment of the needs in the field.

**Implementation Model.** The literature relating to organizational change is extensive and many models to facilitate implementation have been proposed. While intuitively reasonable, the evidence-base supporting most of these approaches is limited. One notable exception is the Organizational Change Manager (OCM) model developed by Gustafson and colleagues at the University of Wisconsin's Center for Health Systems Research and Analysis (UWCHSRA) using Bayesian statistics.<sup>57,58</sup> This model and the associated survey tool (also referred to as the OCM), was developed through evaluation of the organizational attributes that led to successful and unsuccessful change efforts across 221 healthcare improvement projects in the United States, Canada, and the Netherlands and has subsequently been used to predict implementation success.<sup>57</sup> Because of its relatively strong evidence base, PT/BRI QUERI has decided to use the OCM model to guide its implementation efforts. The OCM model has identified 15 factors as predictive of implementation outcome: (1) Project Launch, (2) Project champion, (3) Senior leader support, (4) Middle Manager Support, (5) Staff Needs and Support, (6) Tension for Change, (7) Problem exploration, (8) External influence, (9) Relative advantages, (10) Funding, (11) Flexibility of design, (12) Implementation plan complexity, (13) Staff changes required, (14) Work environment, and (15) Testing and refinement. The associated survey was designed to measure levels of each factor. It is completed by staff (including opinion leaders, providers and program leadership) implementing a change initiative. Scores indicate likelihood of successful adoption and identify areas of potential concern that warrant attention. For example, the survey might indicate that staff have not been adequately involved nor adequately trained to sustain a given practice improvement.

The practical value of administering the OCM survey during the early phases of an implementation effort is that it allows change facilitators (such as QUERIs) and clinical teams to identify potential barriers to implementation of a practice change initiative so that corrective actions can be taken. It may also help educate those seeking to implement a change about factors that influence adoption. Repeat administration of the OCM may also predict the likelihood of sustained change, although the evidence supporting the use of the OCM model to predict sustainability is less well developed.<sup>58</sup>

PT/BRI QUERI uses the OCM survey in conjunction with other methods of formative evaluation (such as qualitative methods and measures of satisfaction) to optimize the likelihood of success of our change initiatives. In addition, PT/BRI QUERI is planning a pilot study that will involve multiple implementation projects to assess the utility of the OCM for VA purposes.

The OCM model provides a framework for measuring barriers and facilitators of change at the external environment, organizational environment, and change microcosms levels. It neglects consideration and measurement of the role of the change facilitator, however. Facilitation has been identified as a potentially important component of successful implementation and is one of three key components in the Promoting Action on Research Implementation in Health Service (PARIHS) framework.<sup>59</sup> Our plan is to augment and improve upon the OCM model through systematic consideration of the role and types of facilitation necessary for adoption and sustained use of a practice change.

**Ongoing Needs Assessment.** Because the care structures and processes for polytrauma care are rapidly evolving, PT/BRI QUERI needs to take an active and ongoing approach toward needs assessment. That is, QUERI steps 1-3 are ongoing. We accomplish this through: (a) research, (b) collaborative relationships with the opinion leaders, VHA Offices, programs, work groups and leaders that influence the system of care, (c) integration into our Core Team of a PRC key informant and opinion leader whom we have designated as our Field Liaison (Rose Collins, PhD), and (d) literature reviews.

**Partnerships with VHA Data System Initiatives and Experts.** To achieve our goal of developing efficient, sustainable and valid data systems for identifying and tracking polytrauma patients, PT/BRI QUERI has been leveraging ongoing data system and data collection initiatives, including those led by the VISN Support Service Center (VSSC), the Office of Information and PM&R. These initiatives are of high priority to VHA and are sufficiently staffed and resourced to achieve their goals in a timely fashion. These ongoing initiatives do not require any additional staff time, an important consideration given the level of stress among PRC clinicians.

PT/BRI QUERI works closely with the Statistics and Data Management Groups within the Center for Chronic Disease Outcomes Research at the Minneapolis VAMC. These teams are well-versed in VA and Medicare data systems, statistics, database design and development, administrative data extraction, data management, storage and security, design, development and implementation of custom applications and websites; project management, and monitoring and validation of data collection.

**PT/BRI Network.** PT/BRI QUERI is developing and coordinating a broad network of: (a) investigators from the VA (including HSR&D and RR&D Centers of Excellence and the National Center for PTSD), DoD, and academic institutions, (b) consumers (patients and caregivers), (c) clinician experts, and (d) managers and VHA leaders. We have developed a database to track our affiliates, monitor their research activities, and facilitate networking among them. PT/BRI QUERI investigators are regularly linked with clinician experts to ensure that projects are appropriate to the field and do not overburden clinicians, patients and caregivers.

**Work Groups.** We have formed a Family Care Advisory Group which consists of representatives from each of the PRCs, the National Director of PM&R, and PT/BRI QUERI. The PT/BRI QUERI Implementation Research Coordinator, Carmen Hall, PhD, is the Family Care Advisory Group facilitator. Dr. Sayer is a member of the VHA Screening Coordination Workgroup which discusses policy, practice and research involving the VHA TBI Clinical Reminder.

**PT/BRI QUERI Core Team.** The research and clinical arms of the PT/BRI QUERI are fully integrated and therefore PT/BRI QUERI sees itself as being one Center. The Core Team is comprised of the PT/BRI QUERI Coordinators and our Field Liaison. It is committed to identifying goals and using methods that meet the needs of patients, caregivers, providers, VHA and external stakeholders.

## II. Management Plan

### II.1 Administrative Structure

PT/BRI's administrative structure consists of a **Core Team**, an **Executive Committee** and **Specialty Work Groups**.

**Core Team.** Through the PT/BRI QUERI Core Team, research and clinical coordination efforts are integrated. Purposeful integration of research and practice is crucial for the success of this QUERI because the evidence for best practice is coming from the field and because the field is highly responsive to VHA leadership, external stakeholders (e.g., Congress) and consumers. We prefer the term Core Team to Coordinating Center because team members are located in different facilities and "Coordinating Center" connotes one physical location. Nina Sayer, PhD (Research Coordinator), Barbara Sigford, MD, PhD (Clinical Co-Coordinator), Carmen Hall, RN, PhD (Implementation Research Coordinator), Rose Collins, PhD (Field Liaison), and the Administrative Coordinator, Nancy Rettmann, MS, are based at the Minneapolis VAMC; Steven Scott, DO (Clinical Co-Coordinator) is based at the Tampa VAMC. Dr. Scott solicits and brings to the Core Team the input and feedback of other Tampa VAMC experts in areas relevant to polytrauma rehabilitation, making the Tampa VAMC rehabilitation team integral to the PT/BRI QUERI Core Team. The Core Team is responsible for the PT/BRI QUERI research portfolio and day to day activities. Conference calls among the Research, Clinical and Implementation Coordinators occur weekly or every other week and QUERI affiliates are invited to join those calls as needed.

**Executive Committee.** PT/BRI Executive Committee (EC) is comprised of investigators, managers and leaders with expertise and job responsibilities relevant to the PT/BRI QUERI mission. DoD clinical managers and experts serve on our EC to ensure that PT/BRI QUERI activities meet the needs of patients with polytraumatic combat injuries, many of whom are active duty at the time of their VA inpatient stays. Drs. Sayer, Sigford and Scott are members of the EC. The EC serves advisory and evaluative functions for the QUERI. It helps shape our strategic plan by prioritizing the identified needs in the system of care that form the focus of our goals and objectives, assisting in networking and coordination efforts, linking us with resources that may advance our goals, contributing to QUERI research in various capacities, and helping us to monitor and evaluate our own progress.

PT/BRI QUERI's goals to improve practice are established annually but adjusted as necessary through needs assessments, review of the literature and government reports, as well as Operations leadership and EC member input and feedback. EC members complete an annual survey prior to our face to face meeting to ensure full assessment of the needs, gaps and priorities in the field of polytrauma rehabilitation and to promote identification of resources, initiatives and programs that will help us advance our mission and achieve our goals. In other words, PT/BRI QUERI uses its EC as a source of information in conducting QUERI steps 1 to 3. PT/BRI QUERI summarizes responses to the EC survey and integrates survey responses with data derived from formal and informal needs assessments. The resultant summary of identified needs is then presented during the annual EC meeting for the purpose of prioritization. Prioritization is crucial to ensuring that our goals and the associated objectives address the most important gaps in the field. PT/BRI QUERI Core Team updates the EC committee on QUERI activities formally every six months during a conference call or face to face meeting, depending on funding and feasibility considerations. However, PT/BRI QUERI has more regular contact with EC members who have roles in specific PT/BRI QUERI projects or initiatives.



**Advisory and Work Groups.** In order to achieve our goals within the area of Family Care, we formed a Family Care Advisory Group, led by Dr. Carmen Hall, the PT/BRI QUERI Implementation Research Coordinator. This group meets regularly to discuss family care within the polytrauma system of care, including usual care, evidence for usual care, and potentially better practices. It is also responsible for the development and implementation of the Family Care Map project which is standardizing and optimizing family care within the PRCs. The Advisory and Work Groups update the Core Team and seek input from VHA and PM&R leadership.

## **II.2 Roles of PT/BRI QUERI Coordinators**

Along with our Field Liaison, the PT/BRI QUERI Coordinators form the QUERI Core Team. The Core Team works closely with the EC and VHA leadership.

**Nina A. Sayer, PhD** is the Research Coordinator and Chair of the PT/BRI QUERI EC. Her responsibilities include policy setting, developing and executing the QUERI Strategic Plan, promoting research consistent with the QUERI mission, and establishing the PT/BRI Network. She works very closely with the Clinical Coordinators.

**Barbara Sigford, MD, PhD** and **Steven Scott, DO**, are the Clinical Coordinators. They ensure that PT/BRI QUERI's agenda and activities are consistent with national and local needs, synergistic with other programs and initiatives being implemented through VA Central Office, and informed by DoD practice and policy. They also facilitate PT/BRI QUERI's close relationship with the PRCs and evolving relationship with the Polytrauma Network Sites.

**Carmen Hall, RN, PhD**, serves as the QUERI Implementation Research Coordinator (IRC). Her responsibilities include leading and participating in the design, implementation and evaluation of PT/BRI QUERI projects, disseminating PT/BRI QUERI products and research findings, and serving as liaison and resource for affiliates within the PT/BRI network, as well as performing literature reviews and researching implementation strategies appropriate to PT/BRI QUERI goals and objectives. Dr. Hall is also responsible for communicating with other QUERI IRCs about projects that may overlap with their goals and impact their activities.

**Nancy Rettmann, MS**, the Administrative Coordinator, is responsible for all administrative activities, including tracking the progress of ongoing and planned projects, managing the QUERI budget, scheduling, organizing the QUERI EC meeting, disseminating publicity and reports to QUERI affiliates, disseminating surveys to EC members, writing and disseminating meeting minutes, and for monitoring and updating the PT/BRI QUERI website.

## **II.3 Key Administrative Collaborations**

PT/BRI QUERI coordinates its work with PM&R and the Rehabilitation Office. The Core Team has regular contact with EC member and Chief Consultant to the Rehabilitation Office, Lucille Beck, PhD. The Clinical Coordinators are leaders within the Polytrauma System of Care and local PIs for the DBVIC. PT/BRI QUERI participates in various national initiatives, including the PM&R FSOD Enhancement Project and TBI Evaluation Template/Database Project, the VHA Screening Coordination Workgroup, the VA National Polytrauma Pain Subcommittee, the VHA Tele-rehabilitation Field Work Group and the DoD-VA Family Transition Task Force. Other administrative collaborators include the National Center for PTSD, the Mental Health Strategic Healthcare Group, the Office of Information, and the Employee Education system.

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